Finding 35 -- SIPS' reserve requirements are increased by the requirement that it pay current funds for all procurements.

SIPS, as a result of a recent policy mandated by the Advisory Budget Commission, is required to finance all procurements with current funds (i.e., no lease-purchase agreements). For the recent upgrade to the IBM ES/9000, this required a cash payment of approximately $9 million. In anticipation of that obligation, SIPS had to set its most recent billing rates at a 36 percent premium over break-even cost recovery to raise its cash reserve balance to the necessary level to finance the upgrade.

If SIPS could operate with a substantially lower reserve without risking its ability to respond to agency needs, it could substantially reduce its billing premium percentage.

Recommendation -- The Advisory Budget Commission should consider reversing its policy and allowing SIPS to acquire major equipment through a lease-purchase agreement.

Assuming a three-year term, SIPS' first year lease-purchase expenditure for its mainframe should be approximately 60 percent less than the purchase expenditure. Second and third year lease-purchase expenditures would be higher since there is no further purchase expenditure in those years. However, the lease-purchase costs would be relatively even over the term and would not cause a major increase in the reserve requirements.

Lease-purchase agreements would appeal to the agencies because they would:

■ Enable SIPS to lower its reserve requirements and hence further reduce its billing rates

■ Charge agencies only for their current resource usage, not to finance future usage as yet undetermined

According to the informal opinion of legislative counsel, there are no constitutional nor statutory restrictions that would prohibit SIPS from acquiring its equipment by lease purchase. The State is authorized to execute a lease-purchase agreement by GS 143-49.

Disaster recovery

Finding 36 - SIPS current back-up strategy is for each individual agency to be totally responsible for backing up its files.

The current disaster recovery philosophy within SIPS is for the individual agencies to back-up their files and data sets and to appropriately identify them as back-ups in the Tape Management System (TMS). Then SIPS takes responsibility for moving the back-up tapes to the off-site location. SIPS itself only backs up the operating system software files.

Recommendation -- SIPS should be responsible to back-up all data center files.

SIPS is in the best position to do this most cost-effectively, while ensuring the highest degree of control over the process. SIPS can spread the back-up process over several days, scheduling it during low utilization periods to minimize impact to production and on-line systems. The user agencies will need to provide SIPS the information needed to identify the files that need to be backed up. The user agencies will still be responsible for logging transactions and audit trails to assist in recovering data between back ups and for developing and maintaining their individual application level disaster recovery plans.

Performance analysis and capacity management

The position of Manager of Performance Assurance, reporting to the Chief of SIPS, was only recently created as the result of the SIPS reorganization. Previously, the performance analysis and capacity management function was performed by one person in the State Computer Center. SIPS initially hired an analyst to take responsibility for the capacity management function in 1988.

Finding 37 -- SIPS' work load and capacity planning study to justify and size the IBM ES/9000 computer upgrade lacked the appropriate breadth and depth of analysis.

The upgrade was made to solve an apparent and widespread problem of poor and continually deteriorating on-line response time.

The work load statistics used in the upgrade study were taken from the June 1990 to August 1991 period. The SIPS analyst stated that there was 62 percent growth in computer transaction volume between the period of July 1990 to December 1990 and the same period in 1991. SIPS performed a regression analysis based on average peak utilization data and determined that the annualized growth rate of peak CPU utilization had been 35 percent and used that as its forecast for future annual growth.

The SIPS analyst acknowledged that the reliability of work load forecasts based on historical data depend on those data reflecting consistent growth. However, SIPS' work load growth had been anything but consistent. There were major jumps in the growth rates of both CPU utilization and computer-transaction volumes. When SIPS presented its analysis to support the upgrade, it made no attempt to explain why this demand would continue to grow, instead of stabilizing or dropping back again.

SIPS believed that the 35 percent growth rate was too high. Given the potential effects of client/server technology and other factors, SIPS expected the ES/9000-900 to have a three-year life, and adjusted the growth rate downward to fit that expectation. This turned out to be a 27 percent annual growth rate.

Regarding upgrade alternatives, SIPS believed there were only two reasonable alternatives:

1. Upgrade to the model ES/9000-820, a 40 percent increase in capacity, or

2. Upgrade to the ES/9000-900, a 100 percent increase in capacity.

SIPS believed that the larger system was more appropriate, since the pending implementation of the new Child Support System in 1995 was expected to require approximately 72 MIPS (approximately 29 percent of the ES/9000 capacity). Also, the vendor's pricing made the cost difference minimal, making the larger system an apparently better choice.

Recommendation -- SIPS should conduct more thorough capacity planning to support hardware upgrade decisions.

SIPS should establish a more disciplined and formal capacity planning process that is based upon detailed workload characterizations and the forecast of individual workloads based on the projected usage by the users and supported by modeling/simulation tools. This is necessary as part of regular capacity management, and it is essential with respect to decisions regarding potential upgrades.

Finding 38 - The performance analysis and capacity management function at SIPS is not performing all the necessary tasks.

The status of this function at SIPS today is as follows:

- Raw SMF and RMF data are being collected and stored

- CPU utilization is being monitored

- Limited utilization reporting is being performed

However,

- No data reduction is being performed

- Utilization of computer resources other than the CPU is not being monitored effectively

- The function does not look at any computer resource other than the CPU

- No simulation or modelling activities are being performed

Recommendation -- SIPS should define a comprehensive and complete performance analysis and capacity management function.

A comprehensive and complete performance analysis and capacity management function should address the following key items:

■ Management planning

■ Service level objectives

■ Natural forecast units (NFUs) and work load forecasting

■ Work load monitoring

■ Usage trend analysis

■ Application tuning

■ System tuning

■ Modelling/simulation

Finding 39 - The capacity management function at SIPS is significantly understaffed.

There is only one analyst assigned to accomplish performance analysis and capacity management functions. The analyst responsible for capacity management stated that over the past year he was only able to spend about 10 percent of his time doing performance analysis and capacity management functions. He had been assigned other tasks instead:

■ Studying the ESC request for its own computer from January 1991 to August, and then again in October

■ Studying the Department of Revenue request for its own computer from November 1991 to January 1992

■ Studying rates for the new processor from February to mid-April 1992

The only time he was performing capacity management efforts was in the August to November 1991 time frame, when he was studying the CPU upgrade needs of SIPS.

Recommendation -- SIPS should dedicate adequate resources to the full time performance of the capacity management function.

3.62

Performance analysis and capacity management on IBM's largest mainframe cannot be adequately performed by one-tenth full-time equivalent (FTE). SIPS has not given high enough priority nor enough support to the capacity management function. Capacity management at a data center the size of SIPS requires from one to two FTEs at a bare minimum, with no diversions to other unrelated studies. SIPS should formalize its capacity management function and dedicate the required resources to perform this function effectively.

Finding 40 - SIPS does not have the necessary tools and methodologies to properly perform the capacity management function.

There are insufficient automated tools supporting the performance analysis and capacity management function. Specifically, there is:

■ No data reduction software

■ Only limited-function reporting software

■ No modeling software

■ No performance monitoring software

The performance analyst/capacity planner stated that the only tool he has available to him is IBM's Service Level Report (SLR) software. It uses RMF data and some SMF data and can report on the following resources:

■ Pages printed

■ Processor utilization (CPU)

■ Communication channel utilization (between the processor and data stored on disk or tape)

■ Accesses to data stored on disk or tape

■ Processor response time (only one component of the response time that a user observes at his terminal)

This software is very difficult for the analyst to work with. The reported difficulties are:

■ No ad hoc user friendly (fourth generation language) reporting capability is available.

■ There are limited standard reports available.

3.63

■ There is no capability to create ad hoc data relationships to facilitate building new types of reports; all data relationships must be pre-defined when the system is set up.

The performance analysis and capacity management function cannot be performed on today's computers without the use of sophisticated software packages for the collection, reduction, analysis, and reporting of necessary data, and for forecasting computer usage and service levels. SIPS does not have the tools necessary to perform these functions. In fact, SIPS made its recent $9 million decision to upgrade its computer hardware without the benefit of information available only from such analytical and reporting tools.

Recommendation -- SIPS should select, acquire, and implement the software tools necessary to support the capacity management function.

The Manager of Performance Assurance noted that he has contracted with a consultant to evaluate and select the software packages required to support this function.

SIPS should follow through on its plans to identify the required tools to support this function, and should immediately procure these software products and train its staff in their proper use. At the minimum, SIPS requires tools to perform the following functions:

■ Data collection

■ Data reduction

■ Data base update

■ Trend reporting

■ Work load characterization

■ Job accounting

■ Forecasting

■ Performance tuning (application and computer system)

Internal management

Finding 41 - Problem reporting and Help Desk activities are fragmented.

Problem reporting at SIPS is currently handled in the following way:

■ Level 1 problem reporting is handled at the Help Desk in Computer Operations using an automated reporting system. It is supposed to be the point where all problem calls enter

SIPS. The Help Desk attempts to solve problems that are expected to take only 2 to 3 minutes to solve. All other calls are referred to Level 2 support.

According to SIPS, not all calls are manually logged in by the Help Desk. Users direct many calls, especially those for Applications and Operations, directly to personnel in these organizations and not to the Help Desk. The Help Desk is not staffed on weekends or holidays.

■ Level 2 problem support is handled by each of the major areas within SIPS (e.g., network control, applications, operations, systems software). This level is staffed with individuals who are better prepared to address technical and more complex time-consuming problems.

Except for the Network Control Center in the Telecommunications Group, there is not a formalized, central point in these groups. The Help Desk places calls to individuals in these other groups, not to any central control point.

■ Working with the SIPS Advisory Board, SIPS has defined new problem management procedures and installed an automated support system for strengthening its problem reporting and resolution. Full implementation is awaiting approval of necessary staff resources.

Recommendation -- SIPS should strengthen and organize its problem reporting function.

An effective problem reporting and tracking function is critical to the successful operation of any large data processing center. Customers must have a single point of contact to call to identify their problems, and these problems must be resolved in a reasonable time frame, subject to the complexity of the problem.

SIPS has only a partial system in place today. It should broaden and organize this function to include:

■ Single point of contact for all calls (level 1)

■ An automated reporting and tracking system (installed, but pending full implementation)

■ Routing of more complex problems to level 2 support, which is comprised of more technical individuals who have the time and expertise to solve the problems

■ Tracking all problems and recording all resolutions

■ Closing each problem with the user who reported it

- Reporting unresolved problems to area management

- Reporting of trends in problems

Finding 42 - SIPS has no internal function responsible to assure high quality user oriented services.

SIPS does not have an independent Quality Assurance function to oversee the quality of the services provided by the entire department. The only quality assurance role in SIPS is within the application systems group.

Recommendation -- SIPS should establish a quality assurance function.

SIPS needs to establish an organizational entity and process that will assure the delivery of quality services to its users. SIPS should take the following organizational steps:

- Eliminate the current quality assurance function under the Client Support Services, Technical Support Services group.

- Create a Quality Assurance function reporting to the Chief of SIPS.

  Quality Assurance needs to be totally independent of the organizational units it oversees. It must also have a broader perspective than just application systems, encompassing all aspects of SIPS' operations -- computer services, telecommunications, and client support services.

  This new organization should be responsible for:

      Coordinating and developing SIPS internal procedures, and

      Coordinating and conducting internal quality assurance reviews.

Finding 43 - SIPS is still managing its mainframe as two separate virtual machines instead of as a single image.

SIPS has one physical mainframe computer. For technical reasons, it is configured as two separate "virtual" computers or "sides," designated as A and B, each dedicated to a group of SIPS users:

- System B supports Highways, Motor Vehicle, and Correction

- System A supports all other users

This structure is a carryover from the original individual data centers that were merged into SIPS. Each virtual machine has its own console and runs its own copy of production job-scheduling software.

Recommendation -- SIPS should combine the two sides of the computer into one single image system.

SIPS should reconfigure the mainframe as a single image system as soon as possible. This will reduce the cost of operations (e.g., fewer operators needed, fewer license fees for copies of software) and facilitate work load balancing on the machine.

Finding 44 - Some production systems at SIPS are not under proper change control.

SIPS maintains separate production and test libraries under the control of the LIBRARIAN software product. However:

■ Almost all COBOL programs are under control of LIBRARIAN, but the FOCUS, ADF, and DMS programs are not

■ SIPS has separate test and production libraries for COBOL and FOCUS systems, but not for those written in ADF and DMS

Procedurally, programmers are allowed to physically move programs and JCL into the production library with the approval of a team leader. Procedures also allow the programmer to move programs into production without approval of a team leader, provided the program modifications have been reviewed by a team leader.

Recommendation -- SIPS should establish a fully functional change management system.

The classic anecdote is that the programmer says: "Don't worry. This change will be transparent to the users," just before his change causes the system to crash. The fact is that even a good programmer can make a trivial error in the process of implementing a change, and that error can wreak havoc with the system.

A change management system should:

■ Increase the likelihood of simple errors being detected and corrected before a change is implemented

■ Reduce the likelihood of such an error occurring during the implementation of a change

■ Reduce the exposure from such an error by simplifying the recovery process

- Notify in advance other system users who need to be aware of the pending change or who are likely to be affected by a successful change

- Not hamper the productivity of the technical staff

With these goals in mind, SIPS should proceed to:

- Place additional controls around the application system change management function to prevent programmers from being able to directly move new programs and changes to programs into the production library.

- Restrict update of the production library to the quality assurance coordinator or change management manager. Updates to the production library should only take place after the programs have gone through a validated test procedure and have been independently reviewed for adherence to SIPS standards.

- Place all test and production programs regardless of their languages or frequency of use and update under the control of the library manager.

- Implement comparable controls over the systems programming function. When an error occurs in this area, it is likely to have broader and more severe consequences than an error in an application. Therefore, change control is that much more important.

Finding 45 - SIPS and its user agencies do not use a formal version/release approach for system maintenance.

The production systems running at SIPS are not under a formal version/release control procedure. Yet many of the programmers batch their system change requests to common programs and implement them at one time, in an informal release process.

Recommendation -- SIPS should formalize a version/release approach for maintaining production systems.

This should make it easier to plan system enhancements, test changes, update documentation, train users, etc. It will also reduce the frequency of production updates, thereby reducing the exposure to errors arising from that process.

Finding 46 - SIPS does not provide adequate back-up support among its systems programmers.

SIPS currently only has one systems programmer knowledgeable on each of the following critical software products:

- IMS

- RACF

- DB/2

When any of these individuals is unavailable for any reason, there is no one else who can support the assigned product or answer questions.

Recommendation -- SIPS should cross train its system programmers to provide more back-up for critical systems products.

Systems programmers should be assigned a primary software product to master in depth and a secondary product to learn enough about to support when the primary programmer is unavailable.

Finding 47 -- Several title classifications affecting SIPS analysts are out-of-date.

The State Office of Personnel changed certain classifications affecting some analyst and manager positions among computer programming staff. SIPS' personnel function has not made the corresponding updates to the classifications that it controls, so some of SIPS' titles are inconsistent with the analogous titles in the agency IRM divisions.

Recommendation -- SIPS should update the affected title classifications.

SIPS' personnel function should update title classifications as necessary to become consistent with other agencies.

Technical leadership

Finding 48 - SIPS has always provided IBM mainframe solutions, but agencies have also needed help with other computer platforms and technologies.

SIPS supports primarily IBM mainframe architectures and products for application systems. Many of the agencies and users in the State have other platforms (e.g., IBM AS/400s, DEC VAXs, LANs) for their applications. According to the agencies, SIPS application group has always attempted to steer them to IBM mainframe solutions instead of providing the capability to meet their needs on different platforms.

Consequently, the agencies have had to hire or develop their own technical experts in the areas where SIPS has been unable or unwilling to support them. Various agencies now have equal or greater expertise than SIPS in telecommunications, LANs, DB/2 data base, and CASE tools.

SIPS should technically be out in front of its clients. Instead, it has been lagging behind.

Recommendation -- SIPS should provide technical leadership and support in all appropriate technologies.

SIPS should be responsible not only to support other technologies besides IBM mainframes, but also to provide technical leadership in them to the agencies.

To advance towards this goal, SIPS should:

- Manage its staffing level and skill profiles to fit the needs of its client agencies in their various technologies and to deliver high quality service.

- Invest in sufficient technical training for the staff to enable them to provide added value to the agencies.

- Move towards an Open System Architecture that will allow connectivity between heterogenous hardware/software products. Even IBM recognizes this need and now supports such open architectures as TCP/IP, UNIX, EtherNet, and others.

Finding 49 -- SIPS training services are well received, but are needed on more and newer products.

Many agencies think highly of SIPS' trainers and the service they provide, which is primarily end-user training on PC products. Most of the training curricula have been focused on the long established word processing and spread sheet products. There is still a substantial need for this training, but many other users are now more sophisticated. There is demand for training on newer versions of old products (e.g., Windows versions) and on additional products such as graphics packages and data bases that SIPS is not yet satisfying.

Recommendation -- SIPS should focus its training where the clients have growing needs.

SIPS should periodically poll the agencies regarding their plans for PC training and also their procurement of PCs and PC software products. This information should help SIPS to plan and market its training curricula to agencies and users that are most likely to need training services.

Finding 50 -- SIPS takes no responsibility for the efficiency of agency applications run at its data center.

Most agencies take responsibility to develop and run their own applications. SIPS provides them the computing resources that they need.

SIPS management feels that since the agencies pay for processing, SIPS' responsibility is just to provide them as much computing resource as they care to use. Since SIPS is part of

the same State government enterprise as the agencies, its responsibility should extend at least to promoting efficient utilization of its resources.

Recommendation -- SIPS should set and enforce appropriate technical standards for new applications.

SIPS should work in conjunction with the SIPS Advisory Board to:

■ Identify appropriate technical aspects of applications that affect utilization of data center resources and that can be manipulated without restricting functionality of an application. For example:

Limitations of on-line data base searches

Blocking factors for efficient data storage

Use of disk instead of tape for temporary files

Managing tape/cartridge files to avoid dismounts followed by remounts

■ Set standards for technical aspects to promote efficient utilization of data center resources.

■ Establish a pre-implementation review process for SIPS to verify compliance with the standards.

Finding 51 - SIPS has not allocated sufficient resources to provide the type and level of support specified for LANs.

As part of its start up for State LAN support, SIPS created two positions that are responsible for LANs:

■ One State LAN integrator (SLI) - responsible for design

■ One State LAN administrator (SLA) - responsible for operating the systems.

SIPS has defined the levels of service to the agencies in four classes, from Class A with maximum support to Class D with virtually no support.

Two people are not capable of providing sufficient support to all of the agencies in the State and for the growing number of LANs installed, being installed, or planned to be installed. In fact, two individuals are not even sufficient to provide Class A or B service for even one large agency in a timely manner.

Recommendation -- SIPS should reevaluate its LAN support function to determine the type and level of support it should provide.

SIPS should survey the State agencies to identify the demand for these services. Based on the services and the expected demand from the agencies, SIPS should staff this function properly.

Because demand for LAN consulting service will probably vary greatly, SIPS should consider contracting for temporary staff to provide these services when demand peaks occur. The inadequate staffing for LAN services could cause more problems than not providing any service at all.

Finding 52 - SIPS' LAN guidelines are too narrow to support agencies' needs.

SIPS has published the following guidelines on LANs:

■ Local Area Network Technical Specifications and Guidelines (Revision: 01.02), dated December 1990

   This document contains the standards associated with LANs and their connection to the SIPS networks. The standards themselves are primarily IEEE or accepted industry standards. The guideline limits the LAN architectures and Network Operating Systems that can be used.

■ Requirements and Procedures for Installing Local Area Networks (Revision: 01.02), dated December 1990

   This document is a compilation of policies, procedures, and standards concerning LANs. It places a large amount of authority and control in SIPS, and states that if requested, SIPS will provide extensive support to agencies.

Several agencies observed that some significant LAN alternatives were not considered in the planning for the LAN guidelines (e.g., use of intelligent hubs versus dumb hubs). These agencies stated that they do not have sufficient guidelines or standards concerning the development of LANs.

LANs are being planned and implemented throughout the State. However, the level of understanding of the technical issues and alternative design components are not uniformly or sufficiently understood.

Recommendation -- SIPS should update its LAN guidelines to address alternative approaches to designing and configuring a LAN.

SIPS should develop additional LAN guidelines and conduct training to assist agencies in the planning and implementation of LANs throughout the State. The guidelines should address the alternative configurations and components that are available when planning a LAN, and also the advantages and costs associated with the various options.

Finding 53 - SIPS' programmers and analysts do not have adequate training to successfully develop systems using the new methodology and CASE tools.

SIPS is about to make FOUNDATION its standard CASE tool and Design 1 and Install 1 its standard methodologies for developing new systems. However, SIPS has not yet addressed a number of critical issues that need to be resolved prior to making this major change.

SIPS:

■ Has not adequately addressed the need for training staff in the use of these tools

■ Has not established the specific standards and procedures to be used

■ Has not provided for adequate availability of work stations to support the CASE tools

■ Has not instituted specific and appropriate quality assurance procedures for this new technology

Recommendation -- SIPS should immediately initiate CASE training for staff and preparation of necessary standards and procedures.

It is generally accepted that a frequent cause of the failure of CASE technology in numerous organizations has been that the tools and methodologies have not been properly introduced.

Although the switch to FOUNDATION as a standard is scheduled for July or August, SIPS must still perform significant planning and preparation. Before SIPS attempts to institutionalize the FOUNDATION CASE tools as a standard and develop its first major system, it must ensure that all involved programmers and analysts are trained in the CASE tools and also in the underlying structured design and development techniques.

Finding 54 - SIPS and its user agencies are still manually releasing and controlling most production jobs.

All agencies do their own production job scheduling, except for Department of State Transportation on its old Highways Information System, which SIPS operates.

Many agencies do not use the automated job scheduling product ZEKE, but instead use Time Sharing Option (TSO) to release their jobs. Some agencies (e.g., Department of Human Resources and Department of Public Instruction) provide SIPS listings of jobs to be run that night, together with actions SIPS should take if problems occur or the name of the people to call in case of problems. The Operations Center Manager at SIPS believes that the user agencies need more training in ZEKE, and SIPS has offered such training.

Many of the production job streams running at SIPS require significant operator intervention to run successfully to completion.

Recommendation -- SIPS should migrate all of the production workload to ZEKE.

SIPS, working with the individual agencies, should continue its effort to migrate more of the agency production work under the control of the automated scheduler ZEKE.

This will require the agency programmers to reengineer their job streams to eliminate operator intervention. SIPS should develop guidelines and directions to assist the agencies in this task. SIPS should also conduct additional training on the use of ZEKE.

Finding 55 - Based on a comparison with other data centers, the State Computer Center (SCC) has the potential to improve certain aspects of its utilization of resources with appropriate support from its user agencies.

Peat Marwick conducted a peer comparison of SIPS' State Computer Center with other data centers in the private sector that process comparable workloads based on the study methodology. The results are included in Appendix C. They indicate that relative to the average of the data centers in the peer group, SCC's data center compares unfavorably with these commercial data centers on certain aspects of resource utilization. These aspects are:

■ Average utilization of the computer over the weeklong prime shift periods

■ Frequency of using tape resources for input

■ Frequency that agency production jobs fail to reach normal termination

■ Level of staffing for direct operations

■ Operating cost per used MIPS, which associates cost with computer utilization

Each of these observations indicates a potential opportunity for SCC and its user agencies to improve the utilization of the respective data center resources.

By its relationship with its user agencies, SCC is constrained from taking independent actions to address these issues. Therefore, it is important to note some fundamental

differences in SCC's public sector operating environment compared to the typical private sector situation. SCC generally has less control over the use that its client departments make of its resources than is found in the private sector, and even less than would be found in some other states. For example:

- Each department has primary control over its application systems so SCC has only limited influence in managing the departments' usage of tape, disk, and software products, and no direct influence over the quality of most of the application systems. Yet, these very factors are the primary reasons for the respective observations cited above.

- In an attempt to get the departments to adjust their utilization of computer resources, SCC revised its billing rates in July 1987 to discourage additional usage during the daily periods of peak demand and to encourge greater usage during off-peak periods. The federal Office of Management and Budget disallowed the rate structure citing the constraints of Circular A-87 on allowable reimbursable expenses.

The impact of SCC operating in its public sector environment is reinforced by comparing its operation to a second Peat Marwick peer group consisting of five federal government data centers. SCC compares favorably regarding critical factors previously mentioned. Specifically, relative to the average of the government data centers in this second peer group:

- SCC's average utilization of the computer is better than the peer group

- SCC's operating cost, averaged on a utilization basis, is approximately ten percent lower than the peer group average

However, SCC still uses more tape and disk and has a few more staff in direct operations than the averages for this group.

In January 1992, Real Decisions Corporation issued the results of a cost performance study that it had conducted on SCC during the latter months of 1991, concluding that SCC is "the sixth-best performer in its size class of 21 installations." The study also found SCC to be the best performer among the seven government data centers in its size class. Notwithstanding the apparent difference between the Real Decisions and Peat Marwick conclusions, the results are compatible.

The Real Decisions analysis focuses on a measurement of cost effectiveness. It is based on the proprietary NOW (NOrmalized Weighted) Index. This index deals with the effect of SCC's billing rates and direct current operating costs on the cost of processing a standard benchmark workload. The analysis considers this effect across eight categories of data center services (e.g., computing, data storage, printing).

The NOW Index for SCC compares its cost on the benchmark workload to an imputed cost if SCC's operating costs were equal to the average for the Real Decisions data base. The Real Decisions conclusion is then based on the ranking of SCC's NOW Index value among the index values for the other data centers in the comparison group. The data centers are grouped according to their installed computing capacity in MIPS, i.e., the size of their computers.

There are two fundamental differences in comparing the results of the two studies. One is the difference in focus -- Real Decisions is focused on cost effectiveness while Peat Marwick is focused on efficient resource utilization. Cost effectiveness relates to the cost of providing a unit of computing services. Resource utilization, as it applies to cost, relates the total cost of computing services to the total quantity of services provided. The second is the difference in peer group composition -- Real Decisions peer data centers are selected based on installed capacity, while Peat Marwick's are selected based on a proprietary measurement of average utilization.

Both studies found that SCC compared favorably to other government data centers. Only when the private sector data base is included in the Peat Marwick study do any differences become apparent.

Both studies are based on SCC's current direct cost to provide its services and the net revenues that recover that cost. However, neither study directly addresses the effective billing rates and the resulting charges (which include some component for reserve accumulation) that SCC's users pay for their usage of data center services.

Recommendation -- The IRMC should direct SIPS and the SIPS Advisory Board to develop and implement significant policy changes to encourage user departments to manage their application systems for greater utilization of SCC resources.

For example, policies should encourage the departments to make technical changes to their systems to reduce inefficient usage of tape and disk storage, to eliminate the causes of technical failures in their production jobs, and to broaden the time periods during which their users put peak demands on their on-line systems.

Generally, on-line computing demand for some applications (e.g., drivers' license, food stamps) depends more on the citizens of the State than on the departments running the programs. These constraints in the government environment often prevent their data centers from achieving the levels of efficiency seen in the better private sector data centers. For SCC to achieve better levels of resource utilization, it will be necessary for the user departments to make some changes to their application systems and their usage patterns (where possible) for those systems, or possibly to authorize SIPS to make certain technical changes for them.